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THE INFLUENCE OF THE MESOSCALE TURBULENCE IN LOWER THERMOSPHERE–UPPER MESOSPHERE ON THE MID-LATITUDE SPORADIC E-LAYER

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ABSTRACT.

In this paper we discuss the influence of mesoscale turbulence in lower thermosphere, measured by radiometeor method, on the characteristics of Es layers, as observed by ionospheric sounding. Mesoscale turbulence has a considerable influence on the average daily values and inter-daily variations of the blanketing frequency fbEs, critical frequency foEs and semi-transparency δfbEs of the Es layer. More intense, probably semi-transparent, Es layers occur during periods of less developed mesoscale turbulence, while weak blanketing Es layers occur when values of turbulence in the lower thermosphere are increased, both in daytime and night-time, for all seasons.

MEASUREMENT TECHNIQUE.

Neutral wind at E region heights has an important role in formation of a layers with increased electron concentration - Es layers. According to the wind-shear hypothesis, proposed initially by Whitehead (1961) and then developed by Gershman *et al.* (1968, 1974, 1976), the presence of a gradient of the zonal wind with heights is necessary to cause layer formation. Such conditions may arise as internal gravity waves or tides propagate through the lower thermosphere. In this paper, we consider the influence of mesoscale turbulence (**B**) in the lower thermosphere on electron density concentration within an Es layer, using a statistical approach. As characteristics of the Es layer, we chose the blanketing frequency fbEs, critical frequency foEs and diapason of semi-transparency δfbEs=foEs-fbEs. We studied the influence of mesoscale turbulence on the parameter fbEs, which is close to the maximum plasma frequency of the Es layer, and the parameter δfbEs, which reflects an inhomogeneous structure of the Es layer. We introduce the dynamical parameter $B = 0.5\ (\sigma U^2 + \sigma V^2)$, where σU and σV are the mean-square values of the zonal and meridional wind velocity components in a horizontal plane during a 1 hour measurement interval.

Measurements of the neutral wind in lower thermosphere have been conducted between 1986 and 1988 in Kazan (56^0 N, 49^0 E), using a meteor locator with phase altimeter (Fahrutdinova, 1989). For joint analysis, we used the Es layer frequency parameters observed simultaneously at the Gorky ionospheric station (56^0 N, 44^0 E). The distance between Gorky and Kazan is 300 km. The azimuthal method of observations is used to study the wind profile by the radiometeor method when the observations are conducted in four directions: North, South, West and East. The dimensions of the sounding region are 200 x 200 km, and thus the spatial separation is - 400 km. The regions sounded by the meteor radar and ionospheric station intersect for observations in the west direction (from Kazan). For joint analysis,